

**WHAT IS CLAIMED IS:**

1 1. A communications method for use in a communications system including a first cell  
2 including a first base station and at least a first wireless terminal, the method comprising  
3 operating the first base station to transmit signals on a plurality of different  
4 communications channels, each individual one of the plurality of different communications  
5 channels each having a physical characteristic which is detectable by said first wireless terminal,  
6 transmitting signals on the plurality of different communications channels including periodically  
7 changing at least one signal transmission characteristic of a first communications channel in said  
8 plurality of communications channels to introduce an intentional variation into said first  
9 communications channel which results in a change in said physical characteristic corresponding  
10 to the first communications channel; and

11 selecting between said plurality of different communications channels for purposes of  
12 transmitting signals to said first wireless terminal in response to feedback information received  
13 from said first wireless terminal indicating the one of the plurality of different communications  
14 channels which provides the best transmission channel conditions for transmissions to the first  
15 wireless terminal at a particular point in time.

1 2. The communications method of claim 1, wherein said different communications  
2 channels consist of different portions of air link resource that is partitioned in at least one of time  
3 and frequency dimension.

1 3. The communications method of claim 1, further comprising: operating the first base  
2 station to periodically transmit a pilot signal in each of said different communications channels,  
3 the pilot signal transmission being independent of information signals transmitted to any  
4 wireless terminal using the different communications channels.

1 4. The communications method of claim 1, wherein said physical characteristic of one of  
2 said different communications channels is different from said physical characteristic of another  
3 one of said different communications channels.

1 5. The communications method of claim 1, wherein said step of periodically changing at  
2 least one signal transmission characteristic to introduce an intentional variation includes:

introducing at least one of a periodic phase and periodic amplitude variation into said at least one of the different communications channels, the periodicity of the at least one variation being longer than the periodicity between the channel condition feedback information received from said first wireless terminal.

6. The communications method of claim 1, wherein said feedback information received from said first wireless terminal channel includes at least one channel quality report.

7. The method of claim 1, further comprising:  
repeating said selecting step, wherein repeating said selecting step includes switching from a previously selected one of said plurality of different communications channels to another one of said plurality of different communications channels which has a better channel quality to said wireless terminal than said previously selected one of said plurality of different communications channels.

8. The communications method of claim 1, wherein said at least one channel quality report indicates at least one of a signal to noise ratio and a signal to interference ratio measured at said first wireless terminal for one of said plurality of different communications channels.

9. The communications method of claim 6, wherein the first wireless terminal transmits channel quality reports to said base station for a plurality of different communications channels, the method further comprising:

operating the base station to receive said channel quality reports transmitted by said first wireless terminal; and

operating the base station to select between communications channels for transmitting information to said first wireless terminal as a function of channel quality reports corresponding to multiple different communications channels, the base station selecting the channel indicated to have the best channel quality for transmission to the first wireless terminal.

10. The communications method of claim 6, further comprising:

operating the base station to schedule information transmission to a plurality of wireless terminals on each of the plurality of different communications channels, said scheduling including assigning information transmission times to different wireless terminals which are to

5 use the same one of the different communications channels.

1 11. The communications method of claim 6, wherein said feedback information is a signal  
2 indicating which one of the plurality of different communications channels the first wireless  
3 terminal has selected to be used for transmitting information to said first wireless terminal, the  
4 method further comprising:

5 operating the base station to receive a feedback signal from a second wireless terminal  
6 indicating which one of the plurality of different communications channels the second wireless  
7 terminal selected to be used for transmitting information to said second wireless terminal; and  
8 operating the base station to control scheduling of transmissions to said first and second  
9 wireless terminals on the same one of said plurality of different communications channels when  
10 said received feedback signals indicate that the first and second wireless terminals have selected  
11 the same communications channel for the transmission of information from the base station.

1 12. The method of claim 11, wherein the base station schedules transmission to the first and  
2 second wireless terminals on said selected same communications channel as a function of  
3 channel quality information provided by said first and second wireless terminals.

1 13. The method of claim 1, further comprising:  
2 operating the first wireless terminal to make measurements of a plurality of  
3 communications channels included in said plurality of different communications channels.

1 14. The method of claim 13, further comprising:  
2 operating the first wireless terminal to select between said plurality of communications  
3 channels based on said measurements and to communicate said selection to said base station.

1 15. The method of claim 14, further comprising:  
2 operating the wireless terminal to transmit said feedback information, said feedback  
3 information indicating said selection to said base station.

1 16. The method of claim 15, wherein said transmitted feedback information includes at least  
2 one channel identifier corresponding to said selected channel or channels, and channel quality  
3 information determined from a signal received on said selected channel or channels.

1 17. The method of claim 1,

2 wherein said plurality of different communications channels includes at least 3 different  
3 communications channels, said three different communications channels including said first  
4 communications channel, a second communications channel and a third communication channel;  
5 and

6 wherein said step of operating the first base station to transmit signals on the plurality of  
7 different channels further includes:

8 changing at least one signal characteristic of each of said second and third  
9 communications channels on a periodic basis.

1 18. The method of claim 17, wherein changing at least one signal characteristic of each of  
2 said second and third communications channels includes changing at least one transmission  
3 parameter used to control an antenna pattern.

1 19. The method of claim 18, wherein the changing of the signal characteristics of said first,  
2 second and third communications channels is performed in a synchronized manner to maintain a  
3 physical difference between each of the first, second and third communications channels.

1 20. The method of claim 18, wherein the changing of the signal characteristics of said first,  
2 second and third communications channels is performed to statistically maximize the maximal  
3 signal to noise ratios of the first, second and third signal communications channels.

1 21. The method of claim 1, wherein said communications system further includes a second  
2 cell including a second base station and at least a second wireless terminal, the method  
3 comprising

4 operating the second base station to transmit signals on a second plurality of different  
5 communications channels, each individual one of the second plurality of different  
6 communications channels each having a physical characteristic which is detectable by said  
7 second wireless terminal, transmitting signals on the second plurality of different  
8 communications channels including periodically changing at least one signal transmission  
9 characteristic of a second communications channel in said second plurality of communications  
10 channels to introduce an intentional variation into said second communications channel which  
11 results in a change in said physical characteristic corresponding to the second communications

12 channel, the changing of at least one signal transmission characteristic of the second  
13 communications channel being performed at a second rate which is different from a first rate at  
14 which the at least one signal transmission characteristic of the first communications channel is  
15 changed in the first cell; and  
16 selecting between said second plurality of different communications channels for  
17 purposes of transmitting signals to said second wireless terminal in response to feedback  
18 information received from said second wireless terminal indicating the one of the second  
19 plurality of different communications channels which provides the best transmission channel  
20 conditions for transmissions to the second wireless terminal at a particular point in time.

1 22. The method of claim 1, wherein said selecting between said plurality of different  
2 communications channels includes switching, and said switching occurs multiple times during  
3 an internet protocol communications session being conducted by said first wireless terminal with  
4 another terminal through said first base station without the internet protocol communications  
5 session being terminated and without the first wireless terminal changing its location within the  
6 first cell.

1 23. The method of claim 1,  
2 wherein said selecting between said plurality of different communications channels  
3 includes switching, and said switching is performed multiple times while said first wireless  
4 terminal remains at a fixed location within said first cell; and  
5 wherein the same carrier frequency is used to transmit signals on said plurality of  
6 different communications channels, said transmitting signals including mixing baseband signals  
7 to passband signals having said carrier frequency prior to transmitting said signals on said  
8 plurality of different communications channels..

1 24. The method of claim 1,  
2 wherein said first communications channel includes a first amplifier and a first antenna;  
3 and  
4 wherein changing at least one signal characteristic of the first communications channels  
5 includes changing the amplification provided by said first amplifier to a signal being transmitted  
6 on said first communications channel.

1 25. The method of claim 24, wherein said plurality of different communications channels  
2 includes a second communications channel, the second communications channel including a  
3 second amplifier and a second antenna; the method further comprising:  
4 periodically changing at least one signal characteristic of the second communications  
5 channel by periodically changing the amplification provided by said second amplifier to a signal  
6 being transmitted on said second communications channel.

1 26. The method of claim 24, wherein the amplification provided by the first and second  
2 amplifiers is changed by changing a control coefficient used to control the amplification  
3 provided by said first and second amplifiers.

1 27. The method of claim 1,  
2 wherein said first communications channel includes a first phase control module and a  
3 first antenna;  
4 wherein changing at least one signal characteristic of the first communications channels  
5 includes operating the first phase control module to change the phase of a signal being  
6 transmitted on said first communications channel;  
7 wherein said plurality of different communications channels includes a second  
8 communications channel, the second communications channel including a second phase control  
9 module and a second antenna; the method further comprising:  
10 periodically changing at least one signal characteristic of the second  
11 communications channel by periodically operating the second phase control module to  
12 change the phase of a signal being transmitted on said second communications channel;  
13 and  
14 wherein said first and second phase control modules are controlled by coefficients which  
15 are changed periodically to cause the first and second phase control modules to make said phase  
16 changes.

1 28. The method of claim 1, wherein said base station includes multiple antennas from which  
2 said base station transmits said signals on the plurality of different communications channels,  
3 wherein said plurality of channels includes a second communications channel in  
4 addition to said first communications channel, the first channel having a gain in a first direction,  
5 the second channel having a second gain in said first direction, the method further comprising:

6 maintaining a difference in the gain in the first direction between the first and second  
7 channels while changing values in a set of control coefficients corresponding to said first  
8 communications channel and a set of control coefficients corresponding to said second channel,  
9 changing values in the set of control coefficients resulting in a change in the gain of the first and  
10 second channels in said first direction..

1 29. A base station comprising:  
2 means for transmitting signals on a plurality of different communications channels, each  
3 individual one of the plurality of different communications channels each having a physical  
4 characteristic which is detectable by said first wireless terminal;  
5 a control module for periodically changing at least one signal transmission characteristic  
6 of a first communications channel in said plurality of communications channels to introduce an  
7 intentional variation into said first communications channel which results in a change in said  
8 physical characteristic corresponding to the first communications channel; and  
9 means for selecting between said plurality of different communications channels for  
10 purposes of transmitting signals to said first wireless terminal in response to feedback  
11 information received from said first wireless terminal indicating the one of the plurality of  
12 different communications channels which provides the best transmission channel conditions for  
13 transmissions to the first wireless terminal at a particular point in time

1 30. The base station of claim 29, further comprising:  
2 means for scheduling information transmission to a plurality of wireless terminals on  
3 each of the plurality of different communications channels, said scheduling including assigning  
4 information transmission times to different wireless terminals which are to use the same one of  
5 the different communications channels.

1 31. The base station of claim 30, further including multiple antennas, each of said plurality  
2 of different communications channels includes at least two antennas; and  
3 wherein said control module for periodically changing at least one signal transmission  
4 characteristic, includes a coefficient generator for generating sets of control coefficients used to  
5 control transmission characteristics of different communications channels in said plurality of  
6 communications channels, said control coefficients controlling the processing of signals to be  
7 transmitted on the different communications channels.

1 32. A communications method for use in a communications system including a first cell  
2 including a first base station and at least a first wireless terminal, the method comprising  
3 operating the first base station to transmit signals on a plurality of different  
4 communications channels, wherein said plurality of different communications channels includes  
5 at least 3 different communications channels, said three different communications channels  
6 including a first communications channel, a second communications channel and a third  
7 communications channel, each individual one of the plurality of different communications  
8 channels each having a physical characteristic which is detectable by said first wireless terminal;  
9 and  
10 selecting between said plurality of different communications channels for purposes of  
11 transmitting signals to said first wireless terminal in response to feedback information received  
12 from said first wireless terminal indicating the one of the plurality of different communications  
13 channels which provides the best transmission channel conditions for transmissions to the first  
14 wireless terminal at a particular point in time.

1 33. The method of claim 32, further comprising:  
2 changing at least one signal characteristic of each of said second and third  
3 communications channels on a periodic basis.

1 34. The method of claim 33, wherein changing at least one signal characteristic of each of  
2 said second and third communications channels includes changing at least one transmission  
3 parameter used to control an antenna pattern.

1 35. The method of claim 34, wherein the changing of the signal characteristics of said first,  
2 second and third communications channels is performed in a synchronized manner to maintain a  
3 physical difference between each of the first, second and third communications channels.

1 36. The method of claim 34, wherein transmitting signals on each of the plurality of  
2 different communications channels includes transmitting different information signals on each  
3 of the first, second and third communications channels to different wireless terminals, the  
4 different information signals being transmitted at the same time using different signal tones but  
5 the same carrier frequency.



1 37. A method of operating a wireless terminal in a communications system in which a base  
2 station transmits information using a plurality of communications channels, each  
3 communications channel having at least one different physical characteristic, the at least one  
4 different physical characteristic of one of the communications channels being intentionally  
5 varied by said base station over time, the method of operating the wireless terminal comprising:  
6 making a channel quality measurements of each of said communications channels;  
7 maintaining channel quality estimates for at least two of said communications channels  
8 at the same time; and  
9 communicating channel quality feedback information to said base station indicative of  
10 which one of said plurality of different communications channels has the best quality for use in  
11 transmitting signals to said wireless terminal.

1 38. The method of claim 37, further comprising:  
2 operating the wireless terminal to select which one of said plurality of communications  
3 channels should be used to transmit information to said wireless terminal as a function of the  
4 channel quality measurements; and  
5 wherein said channel quality feedback information includes a channel identifier  
6 identifying the selected communications channel.

1 39. The method of claim 38, wherein said channel quality feedback information further  
2 includes at least some indication of the quality of the selected communications channel.

1 40. The method of claim 39, wherein said at least some indication of the quality of the  
2 selected communications channel includes at least one of signal to noise ratio information and  
3 signal to interference ratio information.

1 41. The method of claim 38, wherein maintaining channel quality estimates for at least two  
2 of said communications channels at the same time includes:  
3 maintaining a first channel quality estimate for a first communications channel on which  
4 said wireless terminal reports to have good channel quality in said channel quality feedback  
5 information; and  
6 maintaining a second channel quality estimate for a second communications channel said  
7 wireless terminal does not report to have good channel quality in said channel quality feedback

8 information.

1 42. The method of claim 37, wherein maintaining channel quality estimates for at least two  
2 of said communications channels at the same time includes:  
3 maintaining a first channel estimate for a first communications channel;  
4 maintaining a second channel estimate for a second communications channel which is  
5 different from said first communications channel,  
6 the method further comprising:  
7 switching between using the first and second channel estimates in response to the  
8 first base station switching between said first and second channels in response to  
9 feedback information indicating a change in said first and second channels, said change  
10 corresponding to a variation intentionally introduced into said first and second channels  
11 by said base station.

1 43. The method of claim 42, wherein information received from said first and second  
2 channels is modulated using the same carrier frequency, the method further comprising:  
3 performing a demodulation operation on signals received in said first and second  
4 communications channels without changing a carrier frequency used in said demodulation  
5 process from passband to baseband signal format.

1 44. A wireless terminal for use in a communications system in which a base station transmits  
2 information using a plurality of communications channels, each communications channel having  
3 at least one different physical characteristic, the at least one different physical characteristic of  
4 one of the communications channels being intentionally varied by said base station over time,  
5 the wireless terminal comprising:  
6 means for making a channel quality measurements of each of said communications  
7 channels;  
8 memory including channel quality estimates for at least two of said communications  
9 channels at the same time; and  
10 means for communicating channel quality feedback information to said base station  
11 indicative of which one of said plurality of different communications channels has the best  
12 quality for use in transmitting signals to said wireless terminal.

1 45. The wireless terminal of claim 44, further comprising:

2 means for selecting which one of said plurality of communications channels should be  
3 used to transmit information to said wireless terminal as a function of the channel quality  
4 measurements; and

5 wherein said channel quality feedback information communicated by said means for  
6 communicating includes a channel identifier identifying the selected communications channel.

1 46. The wireless terminal of claim 45, further comprising:

2 means for maintaining a first channel estimate for a first communications channel;

3 means for maintaining a second channel estimate for a second communications channel  
4 which is different from said first communications channel;; and

5 means for switching between using the first and second channel estimates in response to  
6 the first base station switching between said first and second channels in response to feedback  
7 information indicating a change in said first and second channels, said change corresponding to  
8 a variation intentionally introduced into said first and second channels by said base station.

1 47. A transmission method for use in a device including multiple antennas, comprising:

2 processing a first signal as a function of at least one coefficient in a first transmission  
3 control coefficient set corresponding to a first channel to produce a first processed signal having  
4 a first physical signal characteristic;

5 transmitting the first processed signal from at least one of said multiple antennas;

6 transmitting at least one other signal corresponding to the first signal, in parallel with the  
7 transmission of said first processed signal, from another one of said multiple antennas;

8 processing a second signal as a function of at least one coefficient in a second  
9 transmission control coefficient set corresponding to a second channel to produce a second  
10 processed signal, said second processed signal having a second physical signal characteristic  
11 introduced by said processing which is different from said first physical signal characteristic;

12 transmitting the second processed signal from at least one of said multiple antennas;

13 transmitting at least one other signal corresponding to the second signal, in parallel with  
14 the transmission of said second processed signal, from another one of said multiple antennas;

15 receiving channel condition feedback information from a wireless terminal at a first rate;

16 and

17 scheduling transmission of signals to said first wireless terminal as a function of said

18 channel condition feedback information.

1 48. The method of claim 47, further comprising:

2 modifying at least one coefficient in said first transmission control coefficient set, by an  
3 amount sufficient to induce a change in said feedback information, at a rate which is less than or  
4 equal to said first rate;

1 49. The method of claim 48, further comprising:

2 modifying at least one coefficient in said second transmission control coefficient set, by  
3 an amount sufficient to induce a change in said feedback information.

1 50. The method of claim 49,

2 wherein said modifying at least one coefficient in said first transmission control  
3 coefficient set is performed at a rate which is less than or equal said first rate; and

4 wherein said modifying at least one coefficient in said second transmission control  
5 coefficient set is performed at a rate which is less than or equal said first rate.

1 51. The method of claim 47, wherein modifying at least one coefficient in said first

2 transmission coefficient set induces at least one of a phase and a gain variation into signals  
3 transmitted using the first channel, the gain variation causing an amplitude variation in the  
4 transmitted signal.

1 52. The method of claim 51, wherein the gain variation introduced into the first channel over

2 a first period of time corresponding to the time between the receipt of channel condition  
3 feedback information from said wireless terminal is less than the gain difference between the  
4 first and second channels during the first period of time.

1 53. The method of claim 47, wherein said first and second processed signals are transmitted

2 at the same time.

1 54. The method of claim 47, wherein said first and second processed signals are transmitted

2 in non-overlapping periods of time which recur on a periodic basis.

1 55. A transmission method for use with a base station including a plurality of antennas  
2 which are used to transmit signals to multiple wireless terminals, the method comprising:  
3 maintaining a plurality of channels between said base station and at least one of said  
4 wireless terminals, said channels having different transmission characteristics;  
5 maintaining for each channel a transmission control coefficient set including at least  
6 one transmission control coefficient used to control at least one of said different transmission  
7 characteristics;  
8 receiving channel condition feedback information from at least one wireless terminals at  
9 a first rate;  
10 changing, at a second rate, the content of each set of transmission control coefficients  
11 over time to induce transmission variations into the signals transmitted using each of the  
12 maintained channels, and  
13 scheduling transmissions to individual wireless terminals using said channels as a  
14 function of received channel condition information.

1 56. The method of claim 55, wherein said the second rate is less than or equal to the first  
2 rate.

1 57. The method of claim 55, wherein each communications channel has a different channel  
2 transfer function, the difference in the channel transfer function resulting in a measurable  
3 channel difference at said wireless terminal.

1 58. The method of claim 55, wherein each channel includes multiple transmit antennas, each  
2 transmit antenna transmitting a signal having the same information as signals transmitted from  
3 other ones of said multiple transmit antennas corresponding to the same channel but which was  
4 subject to different transmission processing prior to transmission as a function of at least one of  
5 said transmission control coefficients.

1 59. The method of claim 55, wherein said different transmission characteristics include at  
2 least one of a gain characteristic and a phase characteristic, said different which differs in an  
3 amount which can be measured by said wireless terminal from another one of said transmission  
4 channels.

- 1 60. The method of claim 59, wherein scheduling transmissions includes:  
2 selecting for a wireless terminal to which a transmission is to be directed, the best one of  
3 said plurality of channels on which to transmit the signal being scheduled for transmission.
- 1 61. The method of claim 55, wherein said plurality of channels includes a first channel and a  
2 second channel, the first channel having a gain in a first direction, the second channel having a  
3 second gain in said first direction, the method further comprising:  
4 maintaining a difference in the gain in the first direction between the first and second  
5 channels while changing the sets of control coefficients corresponding to said first and second  
6 channels.
- 1 62. The method of claim 61, wherein the values of the control coefficients corresponding to  
2 the first and second channels are selected to maximize the directional gain difference between  
3 said first and second channels.
- 1 63. The method of claim 47, wherein the coefficients in the first set of transmission control  
2 coefficients is changed at intervals longer than 35 milli-seconds.
- 1 64. The method of claim 47, wherein the coefficients in the first set of transmission control  
2 coefficients are changed at a rate which is at least one half the first rate, thereby allowing for the  
3 receipt of two channel quality reports from said wireless terminal for each time the first  
4 coefficient set is changed.
- 1 65. The method of claim 47, wherein at least one of said transmission control coefficients is  
2 a complex value.
- 1 66. The method of claim 47, wherein at least one of said transmission control coefficients is  
2 a value used to control the gain of a signal amplifier.
- 1 67. A base station comprising:  
2 multiple antennas;  
3 means for processing a first signal as a function of at least one coefficient in a first  
4 transmission control coefficient set corresponding to a first channel to produce a first processed

5 signal having a first signal characteristic;

6 means for transmitting the first processed signal using at least one of said multiple  
7 antennas;

8 means for transmitting at least one other signal corresponding to the first signal, in  
9 parallel with the transmission of said first processed signal, from another one of said multiple  
10 antennas;

11 means for processing a second signal as a function of at least one coefficient in a second  
12 transmission control coefficient set corresponding to a second channel to produce a second  
13 processed signal, said second processed signal having a signal characteristic introduced by said  
14 processing which is different from said first signal characteristic;

15 means for transmitting the second processed signal from at least one of said multiple  
16 antennas;

17 means for transmitting at least one other signal corresponding to the second signal, in  
18 parallel with the transmission of said first processed signal, from another one of said multiple  
19 antennas;

20 a receiver for receiving channel condition feedback information from a wireless terminal  
21 at a first rate;

22 transmission control means for modifying at least one coefficient in said first  
23 transmission control coefficient set, by an amount sufficient to induce a change in said feedback  
24 information, at a rate which is less than or equal to said first rate; and

25 a scheduler for scheduling transmission of signals to wireless terminals as a function of  
26 said channel condition feedback information.